DOCUMENT RESUME

ED 159 436 CE 017 883

TITLE	Highlights of Fire in the United States: Deaths, Injuries, Dollar Loss, and Incidents at the National, State, and Local Levels.
INSTITUTION	National Fire Prevention and Control Administration (DOC), Washington, D.C. National Fire Data Center.
PUB DATE	Jun 78
NOTE	13p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock Number 003-000-00537-2)
EDRS PRICE	MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS	Age Differences; Community; Community Size; *Costs; *Death; Fire Fighters; *Fire Protection; *Fire Science Education; *Injuries; Place of Residence; Program Improvement; Racial Differences; Safety Education; Sex Differences; State Surveys; Statistical Data
IDENTIFIERS	United States

ABSTRACT

This report provides fire departments, federal and state governments, and others active in the fire protection field with information which can be used to improve the efficacy and targeting of fire prevention programs. As a byproduct, it illustrates ways that state and local governments might analyze their own fire problems. The report describes the magnitude of national fire problems in terms of number of fires, deaths, injuries, and dollars lost. It also describes specific characteristics of the fire problem, such as who the victims are and what the causes are of fires in various types of property. Although some suggestions for reducing the fire problem are included, the reader is encouraged to formulate his own plans. (This is the first report in what is planned to be an annual series.) (CSS)

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Highlights of FIRE IN THE UNITED STATES

Deaths, Injuries, Dollar Loss, and Incidents at the National, State, and Local Levels

U.S. Department of Commerce
National Fire Prevention and Control Administration
National Fire Data Center

June 1978

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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This booklet presents the highlights of the National Fire Data Center's first comprehensive study of the magnitude and characteristics of America's fire problem. The title of our complete report is *Fire in the United States: Deaths, Injuries, Dollar Loss, and Incidents at the National, State, and Local Levels.* It contains, in addition to 100 pages of text, over 100 tables of fire data.

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Highlights

Fire is one of our Nation's major problems. Each year it causes thousands of deaths, hundreds of thousands of injuries, and billions of dollars of property loss. It causes more loss of life and property than all natural disasters combined. In the home it is the second most frequent cause of accidental death. If a "catastrophe" is defined as an event that causes five or more deaths at one time, fire is the catastrophe that occurs most frequently in this country.

If we are to reduce fire losses as much as we can as a Nation, fire departments across the country, Federal and State governments, and others active in the fire protection field need to more clearly identify their fire problems and continually evaluate their priorities for action, priorities that compete for staff time and funds. They need to identify what works and what does not work, and to target programs more accurately. To do these tasks well, they need more detailed, more reliable information than has been available to date.

Objectives of This Report

This report is intended to provide part of the information that is needed for the above purposes. As a by-product, it illustrates ways that State and local governments might analyze their own fire problems. It is the first in what is planned to be an annual series.

The report describes the magnitude of the national fire problem in terms of numbers of fires, deaths, injuries, and dollars lost. It also describes specific characteristics of the fire problem, such as who are the victims and what are the causes of fires in various types of property. Although some suggestions for reducing the fire problem are included, the reader is encouraged to formulate his own.

Better Fire Data Needed

Before discussing findings, we must emphasize that the fire data currently available leave much to be desired in completeness, accuracy, and comparability—especially for rural sections of the United States. This report is uneven in detail on different aspects of the fire problem largely because of the deficiencies in the available data. For example, the most detailed data on fire causes were available for a full year only for two States—California and Ohio. A few other States had detailed data, but not in a form that was easily comparable. The limited State data available this year were supplemented by data from seven cities (in other States) with compatible data systems.

In spite of the shortcomings, however, we think that the available data accurately characterize some major aspects of the U.S. fire problem. Sources drawn upon for this report included the following: National Fire Protection Association (NFPA); Center for Health Statistics of the U.S. Department of Health, Education and Welfare (HEW); insurance industry; National Fire Incident Reporting System (NFIRS) of the National Fire Prevention and Control Administration (NFPCA); National Household Fire Survey; and State Fire Marshals' reports.

Improved fire data is likely in the near future. More and more State and local governments are upgrading their fire data collection programs. Participation in the National Fire Incident Reporting System is growing. And more attention is being paid to fire data at all levels of government. But there is clearly still a long way to go.

Some of the key findings in this report are summarized below. Except where otherwise noted, all the findings are based on information about fires that were attended by the fire service. References in parentheses below indicate where each finding is given in the report.

National Estimates Show Severe U.S. Fire Problem

In the mid-70's the Nation's annual fire experience was approximately as follows:

FIRES	2,600,000	Reported to Fire Service
	30,000,000	Not Reported to Fire Service
	32,600,000	Total
DEATHS	7,500	
INJURIES	110,000	Reported to Fire Service
	200,000	Not Reported to Fire Service
	310,000	Total
DOLLAR LOSS ..	$ 4.2+	Billion Direct Property
	$ 9.4+	Billion Other Costs
	$13.6+	Billion Total

See Part I Section II for data interpretation notes.

When these U.S. statistics are compared with those from other industrialized countries, our fire incidents, casualties, and dollar loss *per capita* are found to be among the highest in the world. U.S. casualties and losses *per fire*, however, are slightly below average compared to other countries. These results support the increasing belief that in order to make a major dent in the national problem we need to emphasize better five prevention. (Part I, Table 8)

Estimates for the above U.S. statistics differ widely from source to source, sometimes by 50-100 percent. This variation is a result of different methods and assumptions used in collecting and analyzing the data. (Examples of the variation for each estimate are given in Part I, Table 2.)

Fire Deaths Are Highest in the Home

- Residential fires are the main killer and should receive high priority in prevention programs if we are to reduce fire deaths significantly. We think that the use of smoke detectors, coupled with escape plans, is one of the promising ways to reduce this toll.

- Roughly two-thirds of fire deaths occur in residences, mostly in ones and twos in the victims' own homes. However, the less than 4 percent of fire deaths that occur in multiples of five or more draw the most attention. As a result, the residential fire danger probably is underestimated by the public.

- Only a small fraction of deaths (for example, 7 percent in California and Ohio) are in commercial or institutional places such as nightclubs, schools, jails, offices, or nursing homes. We should not, of course, permit these statistics to let us get complacent about the threat of fire in public buildings lest we invite more frequent catastrophes such as the 1977 Southgate, Ky., nightclub fire. (Part I, Tables 13 and 18)

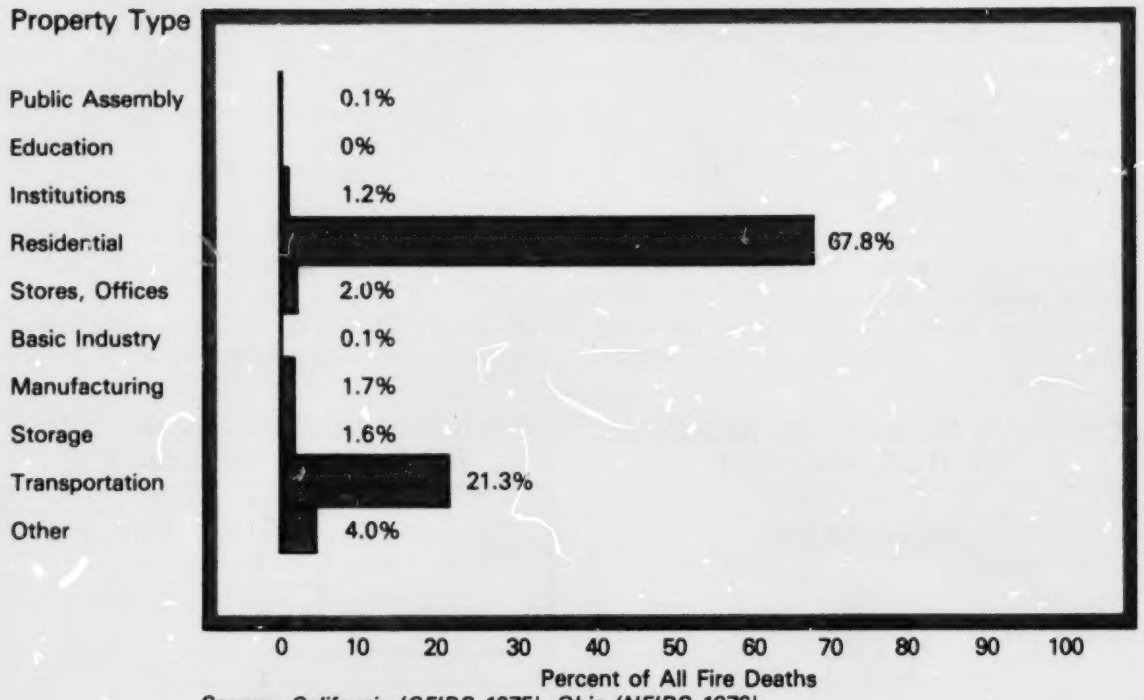
Who Dies

- Among civilians (that is, anyone not a firefighter), males (especially nonwhite males), the very old, and the very young are high risk groups that fire prevention should focus on. While the problem of high fire death rates among the elderly, children, and nonwhites has long been known, the predominance of males as victims has not. This problem deserves more attention in prevention programs than it has received.

- Nationwide, males outnumber females almost two to one as fire death victims. Nonwhite males have more than twice the fire death rate of white males and almost twice that of nonwhite females. And nonwhite females have almost three times the rate of white females. (Part I, Figure 2)

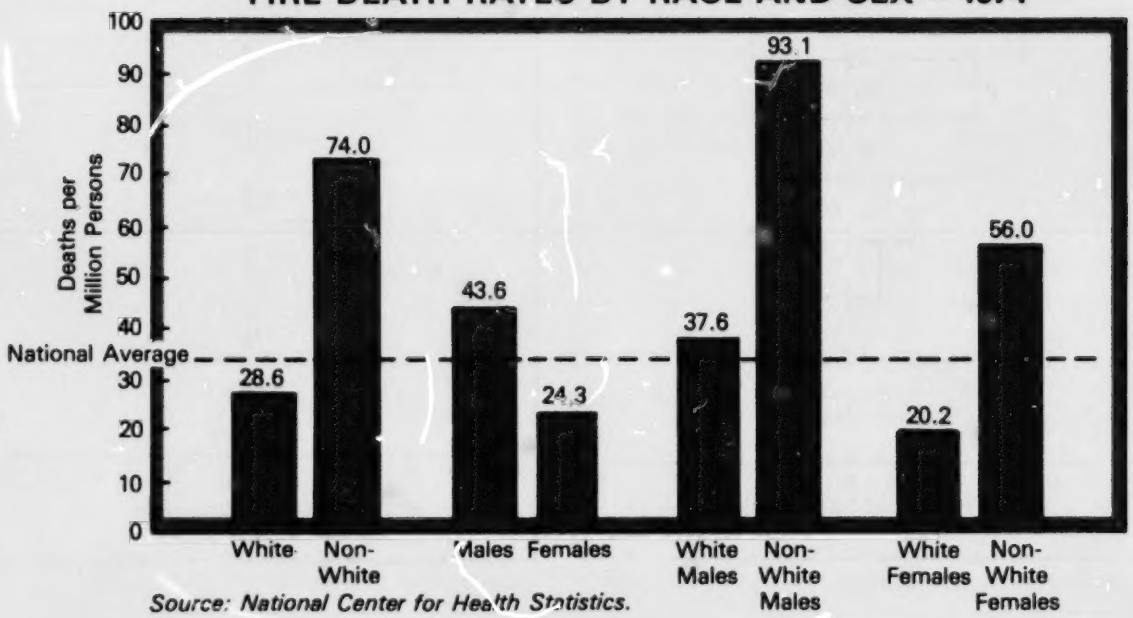
- Firefighters have the Nation's most hazardous profession in terms of death rates. Not surprisingly, they also have the highest fire death rate for any group in our society—it is over 25 times that of civilians. Firefighter on-duty deaths are most often (45 percent) caused by heart attacks and other cardiovascular problems, which suggests the potential importance of improving fire service physical fitness programs. (Part I, Table 5 and Section IV)

WHERE FIRE DEATHS OCCUR



Source: California (CFIRS 1975), Ohio (NFIRS 1976).

FIRE DEATH RATES BY RACE AND SEX — 1974

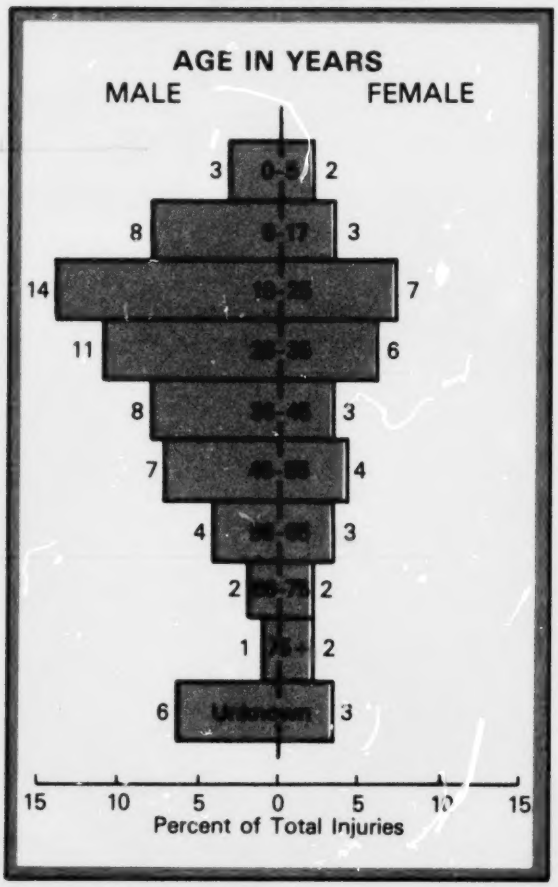


Source: National Center for Health Statistics.

Who Gets Hurt

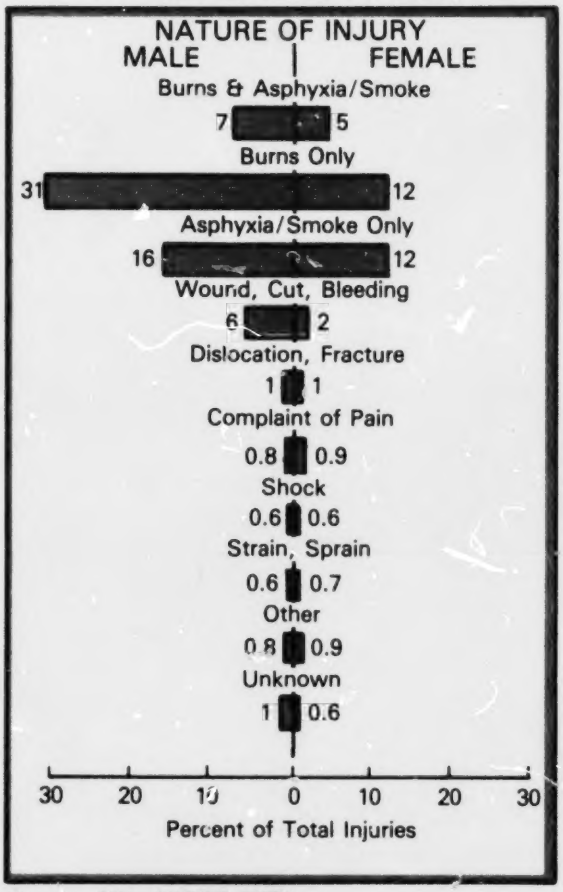
- Unlike deaths, the risk of fire injury is highest for those in the 18-35 age group, and not the very young and very old. This may be due to a greater number of exposures to danger for people in their most active years, but an increased ability to escape with minor injuries when exposed. (Part I, Table 28)
- For civilians in Ohio, the only State for which we have injury data by sex, about the same two-for-one male-female ratio is true for injuries as for deaths. Male injury victims outnumber female victims not only overall, but also for every age group under 65. (Part I, Figures 2, 12; Part II, Table 27)
- Civilian fire injuries are largely due to burns or "smoke" inhalation or both (83 percent in Ohio). As was noted for civilian deaths, smoke detectors offer good potential for reducing these injuries. Further research is needed on the relative frequency with which the various components of "smoke" caused either death or injury as a guide to both prevention and medical care. (Part I, Table 12; Part II, Table 32)
- Firefighter injuries also require more attention in research and prevention than they have

CIVILIAN NON-FATAL INJURIES BY AGE AND SEX



Source: Ohio (NFIRS 1976).

CIVILIAN NON-FATAL INJURIES BY NATURE OF INJURY



Source: Ohio (NFIRS 1976).

received if we are to reduce the Nation's fire injuries significantly. Firefighters incur over half of the injuries sustained at fires they attend. This nationwide estimate is supported by the detailed analysis of data from Ohio (56 percent) and in seven cities elsewhere (54 percent). (Part I, Table 5; Part II, Table 32)

- Firefighters need an across-the-board improvement in their protective clothing. They need to make greater use of breathing apparatus. They need to achieve and maintain a higher level of physical fitness. And they need better fire safety training. "Smoke" (often carbon monoxide) inhalation seems to be the most common type of firefighter injury. In Ohio, for example, smoke inhalation accounted for 25 percent of incident-related injuries to firefighters, followed by strains and sprains (17 percent), cuts or wounds (17 percent), and burns (11 percent). (Smoke and burns combined were another 4 percent.) Firefighter injuries other than smoke inhalation were distributed roughly evenly over the body. (Part I, Table 5; Part II, Tables 29, 31, 32)

It should be noted that the injury data—both for civilians and firefighters—are of much more questionable accuracy than fire death data. The major uncertainty probably is the degree of under-reporting (though in some cases, over-reporting) of minor injuries.

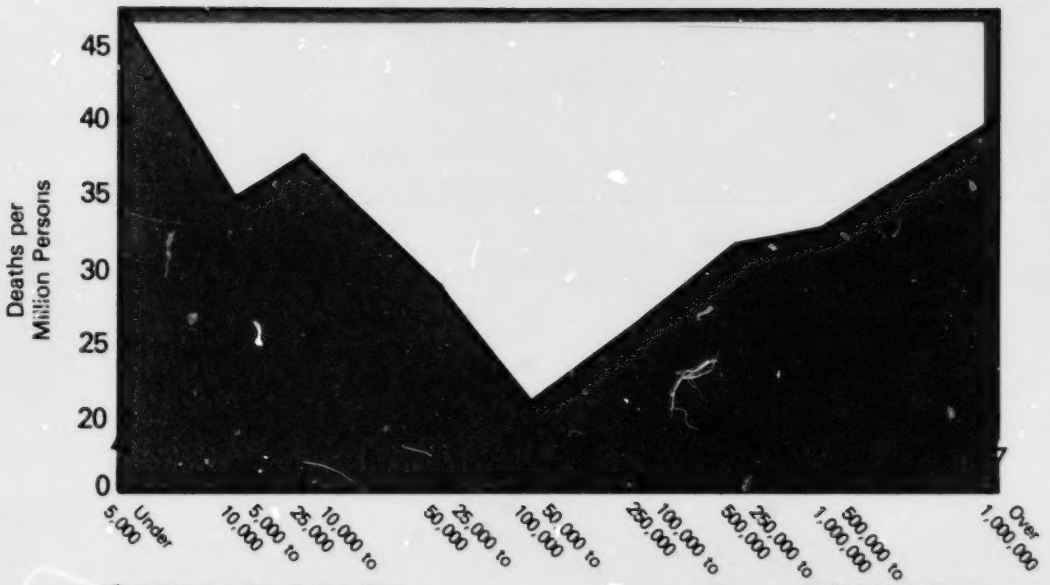
The Problem Varies by Location

- Overall, the fire death problem seems more severe both in large cities and in rural communities than in mid-sized communities. Fire death rates plotted versus population size have a U-shaped pattern, with a low in medium-sized cities (50-100,000 population) and highs in cities of over a million population at one extreme and in small towns and areas of under 5,000 population at the other, according to NFPA 1974 survey data. Supplemental data gathered from cities over one million population indicate that the big city fire death rate may be even higher than shown in the figure, perhaps exceeding 50 deaths per million on the average. (Part I, Figure 4)

Patterns for fire incidents, injuries, and dollar loss are more complex and less reliable than for deaths, and are not easily summarized. (See Part I, Figures 4 and 14 for the patterns.)

- Statewide fire death rates are highest in Alaska and Maine and the belt of Southern States from Oklahoma, Arkansas, and Louisiana through Tennessee, Mississippi, Alabama, Georgia, and the Carolinas (over 42 deaths per million in

FIRE DEATH RATE BY COMMUNITY SIZE



Source: 1974 NFPA Survey.

each State). The fire death problem in these States is serious during the period considered. However, in any given year, a State just by laws of chance may have a high fire death rate.

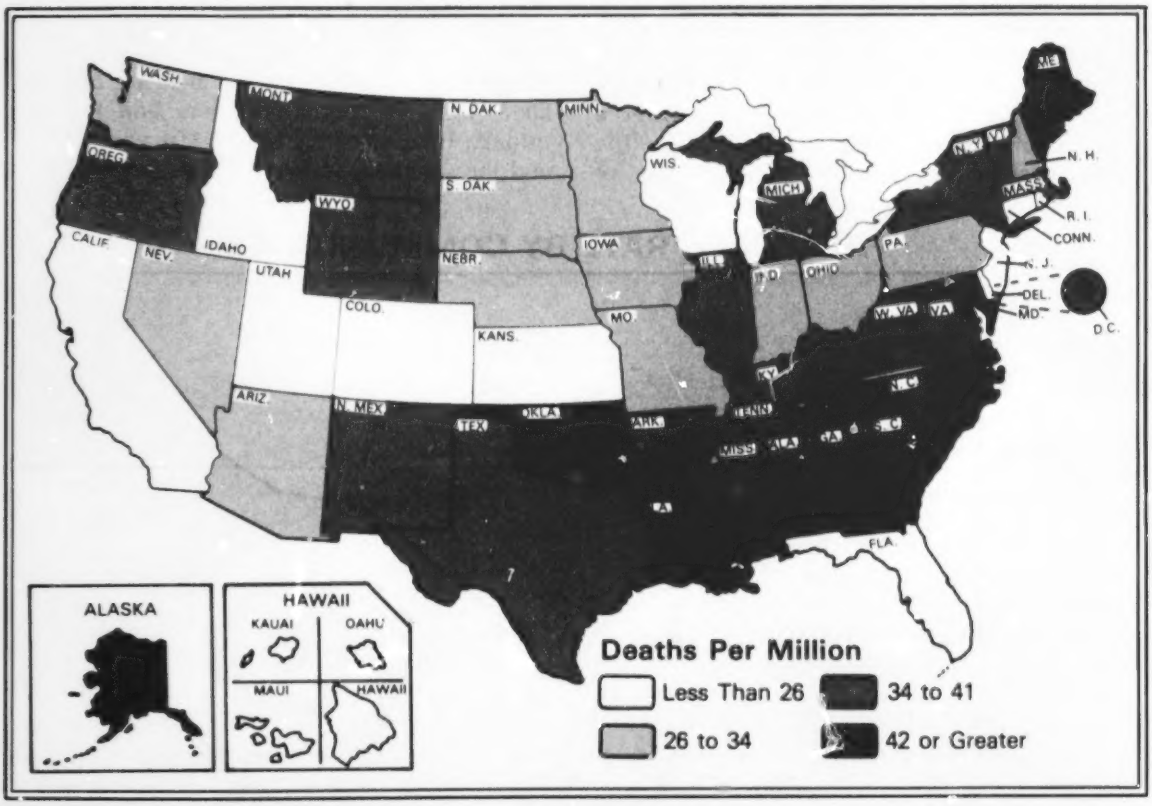
- State and local governments should analyze their own fire problems and not rely on analyses from others. National trends and regional similarities exist, but there are also striking differences from place to place. To cite one example for residential fires, some of the six Ohio cities with over 200,000 population had smoking-related fires far outnumbering cooking-related fires, some had the reverse, and some had both about the same. In some of these cities arson outnumbered both cooking and smoking as a cause of residential fires; in others arson was lower than both. While some of the variation might be due to differences in reporting procedures, some of it is probably real. Each community should try to identify its own priorities and to learn why it differs from others. (Part II, Table 48)

Deaths Trend Downward, Dollar Loss Upward

- The annual U.S. fire death rate has declined slightly during the last 20 years, though it is still among the highest in the world. We did not find adequate data for assessing trends in injuries. (Part I, Figure 10)

- Direct dollar loss from fire, adjusted for inflation, has about doubled over the last 20 years. Per capita dollar loss, also adjusted for inflation,

STATE FIRE DEATH RATES—
DEATHS PER MILLION POPULATION (AVERAGE 1974-75)



Source: State Fire Marshals and National Center for Health Statistics.

has increased by about 40 percent over this same period. But, overall, losses have remained a fairly constant percentage of the Gross National Product. (Part I, Figures 7, 8, and 9)

Eight Cause Categories Predominate

For the two States examined in detail–Ohio and California—and seven additional cities with comparable data systems, the leading causes of fire are described below. These data may or may not be representative of the entire United States; they collectively represent about 15 percent of the U S. population, but are not a random sample. In general, the cause pattern was quite similar in the two States and the seven cities.

In the two States combined, **residential fires** are only 22 percent of all fires attended by the fire service; but they account for 68 percent of deaths, 57 percent of injuries, and 43 percent of dollar loss. (Part I, Table 13)

- The eight major "known" cause categories of residential fires in the two States combined are, in order of frequency: cooking (18 percent), smoking (13), heating (13), incendiary or suspicious (11), electrical distribution (7), appliances (7), children playing (5), and carelessness with open flames or sparks (5). These general "cause" categories are shorthand for groups of more complex causes. The percentages shown in parentheses are of all fires attended by the fire service, not just "known cause" fires. The actual percentages thus may be somewhat higher, depending on the true causes of the 10 percent of fires listed as "unknown." (Part I, Figure 13)

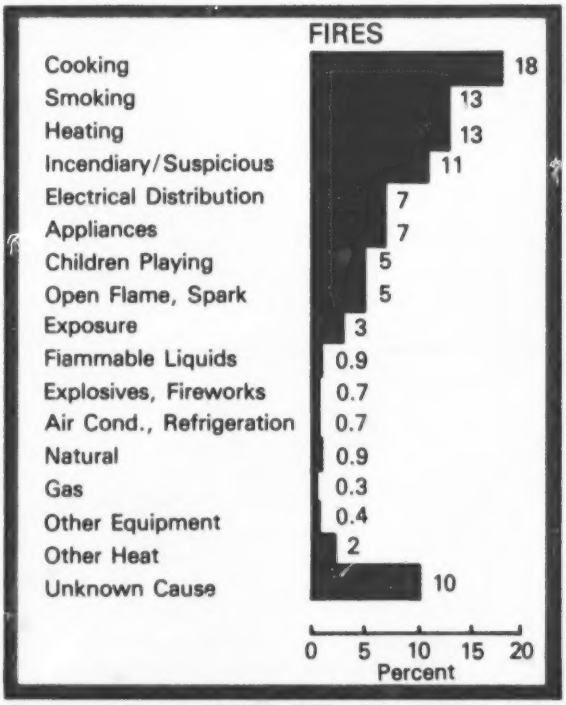
- Among cooking fires, cooking left unattended (for example, while talking with neighbors or watching TV) was the most common problem. For smoking-related fires, dropped, thrown, or abandoned cigarettes were the most common problems. For heating-related fires, there appear to be sharp regional differences in the nature of the problem: Failures of central heating systems and construction of deficiencies in fireplaces lead a wide variety of mechanical and operational problems in Ohio; "combustibles stored too close" to fixed room heating equipment and water heaters, and, surprisingly, "misuse" of fireplaces are among the leading heating-related problems in California. (Part II, Tables 38, 35, and 40)

- The most frequently reported cause of residential *deaths* (29 percent) and *injuries* (18 percent) in the two States is smoking, mostly cigarettes igniting bedding, mattresses, or upholstered furniture.

The second most frequent cause of residential fire deaths and injuries in the two States, surprisingly, is cooking fires (9 percent of deaths, 13 percent of injuries). Although most people probably think of cooking fires as minor, they occur frequently; and the small fraction of them that are not minor cause a large number of casualties.

Heating-related fires (8 percent of deaths, 12 percent of injuries) and incendiary/suspicious fires (6 percent of deaths, 12 percent of injuries) are close behind cooking as third and fourth causes of casualties.

CAUSES OF RESIDENTIAL FIRES

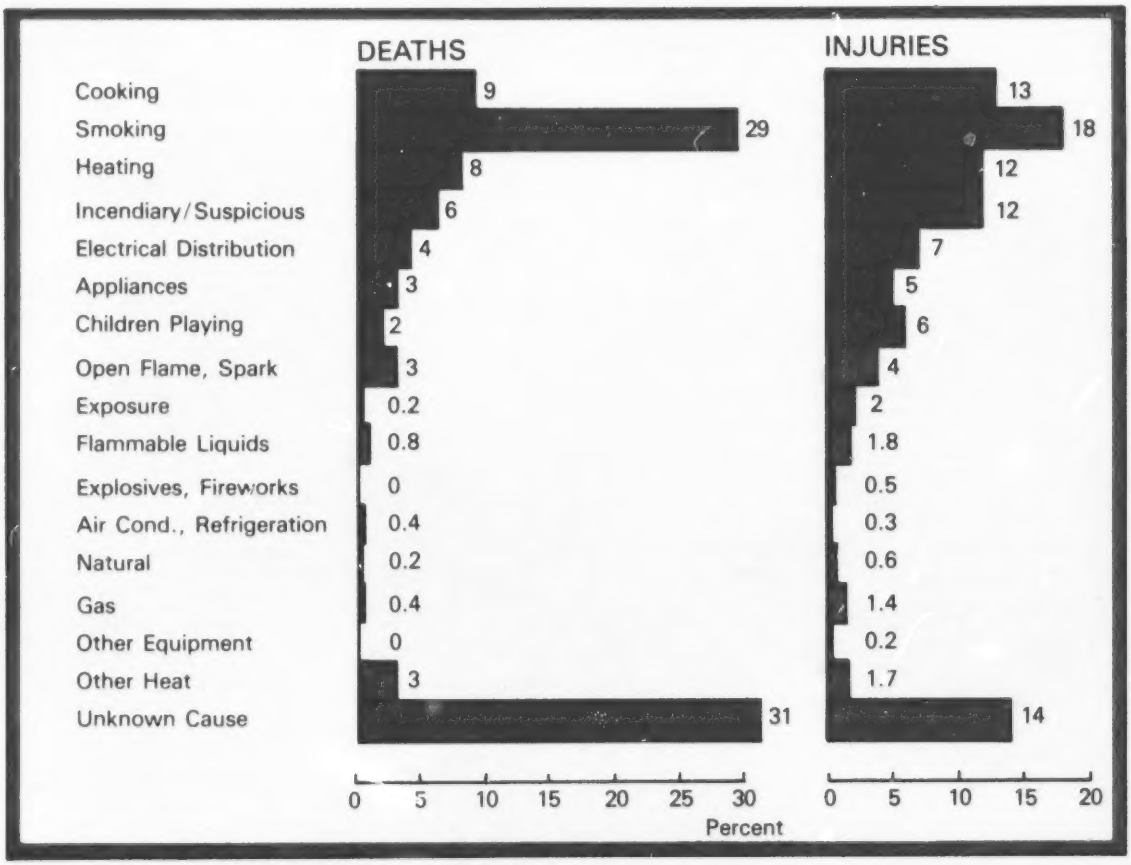


Source: California (CFIRS 1975), Ohio (NFIRS 1976).

Again, percentages here are of total fire deaths, not just those with a known cause. Actual percentages may be considerably higher depending on the true nature of the "unknown cause" deaths—an enormous 31 percent in these two States. (Part I, Figures 13; Part II, Table 33)

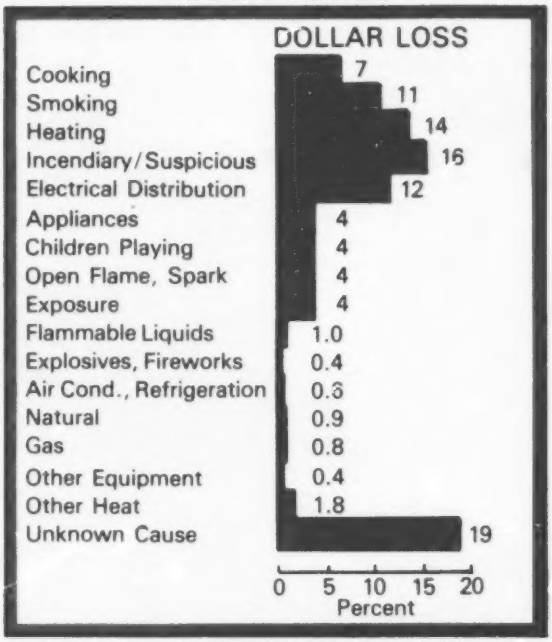
- The known cause accounting for the most *dollar loss* is incendiary/suspicious fires (16 percent). Next highest is heating-related fires (14 percent). (Part I, Figure 13)
- Better fire investigation and reporting practices are needed to reduce the number of fires with cause listed as "unknown." There always will be some fires for which the cause will be unknown, but the fraction today seems excessive. "Unknown" is the leading cause category in the two States for deaths (31 percent) and dollar loss (19 percent), second for injuries (14 percent), and fifth for the number of fires (10 percent). Although the known causes discussed above clearly are important ones, their rank ordering could change significantly depending on what the "unknown" causes actually are. (Part I, Figure 13)

CAUSES OF RESIDENTIAL FIRE CASUALTIES



Source: California (CFIRS 1975), Ohio (NFIRS 1976).

CAUSES OF RESIDENTIAL FIRE DOLLAR LOSS



Source: California (CFIRS 1975), Ohio (NFIRS 1976).

Non-residential building fires in the two States account for only 10 percent of all fires, 7 percent of deaths, 26 percent of injuries, but for 43 percent of dollar losses—tied with residential dollar loss (Part I, Table 13). Non-residential buildings cover an enormous range of structures and uses and probably should not be viewed as a single category. Principal causes vary considerably for different types of non-residential buildings, and prevention efforts should be tailored to the leading causes in each.

- Overall, incendiary and suspicious fires are the number one problem for non-residential buildings. They account for 20 percent to 25 percent of non-residential building fires, deaths, injuries, and dollar loss. "Unknown" is the second most frequent cause reported (13 percent). The next most frequent cause categories are electrical distribution fires (11 percent), carelessness involving open flames or sparks (8 percent), and smoking related fires (8 percent). As with residential, the unknowns could change the rank orderings. (Part I, Table 18)

- For each category of non-residential occupancies, in the two States, the leading causes are shown below. More than one cause is listed when one alone did not dominate:

Public Assembly	Cooking (mainly restaurants) Incendiary/Suspicious
Education	Smoking Incendiary/Suspicious in public day schools
Institutions	Smoking Incendiary/Suspicious
Stores, Offices	Incendiary/Suspicious Electrical Distribution
Basic Industry	Electrical Distribution (mostly from fires in the energy distribution industry)
Manufacturing	Many assorted causes
Storage	Incendiary/Suspicious
Vacant, Construction	Incendiary/Suspicious

(Part I, Table 18; Part II, Section XI)

Unreported Fires Should Not Be Disregarded

Fires not reported to the fire service cannot be assumed to be trivial. About 9 out of 10 fires in households are not reported to fire departments, according to the 1974 National Household Fire Survey of 33,000 households. Most of these unreported fires involve cooking and are very small. However, the survey showed that almost half of the fires causing injuries severe enough to result in time lost from work were not reported to the fire service. And over half of the fires with more than a $200 loss were not reported. Another survey in a year or two is needed to see if these results will still apply. (Part I, Section IV)

Findings Should Be Used to Reduce Losses

Knowledge of the most common causes of fires can be used in setting prevention priorities. The priority to be assigned to any particular cause is not necessarily its frequency rank, however.

Sometimes a greater reduction in fire loss can be achieved per dollar or man-year spent on preventing a lower ranking cause than a higher one, because of the difficulty in making progress on the higher one. And sometimes a group of citizens may have a disproportionately high casualty rate due to a cause that is not one of the most frequent ones community-wide. Priority setting must consider these productivity and equity issues as well as frequency of occurrence.

To reduce fire losses further, fire protection leaders, prevention officers, researchers, code makers, and others concerned with the Nation's fire problem can now make use of the improved information they called for. Making sure that fire prevention efforts are targeted accurately in each community is perhaps the most important "next step." When this is done, it will show the thousands of firefighters who are bearing the brunt of data collection that their efforts are paying off.